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Alloxenia in Three Sympatric African Species of *Cuculus*

By Herbert Friedmann [1]

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In a recent note (1967) I have proposed the term "alloxenia" to describe the situation wherein two or more related species of parasites tend to use different species of hosts. Opposed to this is the term "homoxenia," signifying the use of the same hosts by different species of parasites. Just as geographical or ecological allopatry is of obvious significance in the economy of related species with fairly similar habits, so too the avoidance of needless or of difficulty-inducing competition for brood hosts that is brought about by alloxenia confers definite advantages on parasites with fairly similar needs. Given sufficient time for development, alloxenia is, indeed, a situation that one might expect to develop under the influence of natural selection. The actual existence of alloxenia cannot be assumed, however, until a considerable body of observational data is available for its elucidation.

The object of the present paper is to demonstrate that we have now reached this point in our knowledge of the three largely sympatric species of *Cuculus* in Africa. As a matter of fact, I had anticipated this situation in my book on all the African parasitic cuckoos (1949a, p. 190) when I wrote that they appear "to divide up both

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the African landscape and the African avifauna in such a way as to avoid undue host competition among themselves . . . ." In the present paper I am concerned with three of these cuckoos, all of which occur together in many parts of the continent and on which we have much more information than was available 20 years ago.

In the prolonged task of amassing egg record data, I have been helped by several collectors and observers who have generously sent me unpublished data. Due thanks for their contributions are here given to R. I. G. Attwell, G. Duve, B. V. Neuby-Varty, G. Symons, V. G. L. van Someren, and C. Vernon.

The red-chested cuckoo, *Cuculus solitarius*, is by far the best known of all the African species of its genus. The black cuckoo, *C. clamosus*, is becoming more adequately understood although its suggestive and yet puzzling plumages (the so-called *mabirae*, *jacksoni*, and *gabonensis* entities) are still awaiting satisfactory clarification. The third member of the genus, *C. canorus gularis*, the yellow-billed cuckoo, is the least often observed and, hence, the least fully documented. Enough is now known of the egg morphism and of the host selection of each of these species, however, to be able to make some meaningful comparisons.

For the first species, there are now available to me data on 134 instances of its parasitism involving some 39 species of hosts (or 45 kinds of birds if we list subspecies as well). These data give a good picture of the range and of the frequency of host choice by the red-chested cuckoo. Of the 39 species of hosts, 20, or 51.3 percent, are thrushes, but the percentage of the total number of records of parasitism that involve thrushes as hosts is even higher—69 percent, or 93 out of the total 134 records.

For *Cuculus clamosus*, we now have information on 39 cases of its parasitism involving 16 species of hosts (or 21 if we include subspecies). Of these, 26 instances, or 66.6 percent of the total, involve seven species of shrikes. On the other hand, only three species of thrushes have been noted as victims of the black cuckoo, and for two of these there is as yet but a single record—and only two records for the third species.

The data for *Cuculus canorus gularis* are much less adequate: 14 definite and 3 indefinite records, involving 7 definite and 3 indefinite host species. Of the definite records, 8, or 57 percent, involve three species of shrikes; 3 involve one species of drongo; 1 each involve single species of bulbuls, starlings, thrushes, and weaver finches; while the 3 indefinite instances involve one shrike and two kinds of thrushes.

In the present paper I list the currently known hosts of each of these cuckoos and also describe their egg morphism in order to determine what, if any, host egg adaptations may have evolved. In con-

sidering each of these host catalogs, the reader should keep in mind that these lists will grow steadily as additional field data become available and that we may well find it necessary to reappraise the apparent preferences of the third and least known species.

Red-chested Cuckoo: *Cuculus solitarius*

The hosts recorded so far for this species are as follows:

	Records
Motacilla c. capensis Linnaeus	8
M. c. wellsi Ogilvie-Grant	2
M. alba vidua Sundevall	8
Anthus novaeseelandiae cinnamomea Rüppell	1
A. leucophrys zenkeri Neumann	2
Prionops plumata poliocephala (Stanley)	1
Tchagra species	1
Pycnonotus barbatus tricolor (Hartlaub)	4
P. b. layardi Gurney	2
Andropadus v. virens Cassin	1
Baeopogon indicator (Verreaux)	1
Chlorocichla flaviventris centralis Reichenow	1
C. flavicollis pallidigula (Sharpe)	1
Saxicola t. torquata (Linnaeus)	3
S. t. axillaris (Shelley)	5
Cercomela familiaris hellmayri (Reichenow)	1
Monticola rupestris (Vieillot)	6
Pinarornis plumosus Sharpe	4
Cercotrichas coryphaeus (Linnaeus) subspecies	1
C. leucophrys brunneiceps (Reichenow)	2
C. barbata (Finsch and Hartlaub)	1
Alethe a. archeri (Sharpe)	1
Pogonocichla swynnertoni (Shelley)	1
Cossypha humeralis (Smith)	2
C. n. natalensis Smith	2
C. n. intensa Mearns	1
C. c. caffra (Linnaeus)	34
C. c. iolaema Reichenow	1
C. cyanocampter barttelоti Shelley	1
C. semirufa intercedens (Cabanis)	7
C. h. heuglini Hartlaub	9
C. h. subrufescens Bocage	2
C. dichroa (Gmelin)	2
C. niveicapilla melanonota (Cabanis)	1
Neocossyphus poensis praepectoralis (Jackson)	1
Stizorhina f. fraseri (Strickland)	1
Turdus libonyanus tropicalis Peters	3
Muscicapa a. adusta (Boie)	2
M. c. caerulescens (Hartlaub)	1
Terpsiphone rufiventer tricolor (Fraser)	1
T. viridis (Müller)	1
Remiz m. minutus (Shaw and Nodder)	1
Nectarinia f. famosa (Linnaeus)	1
Passer m. melanurus (Müller)	1
Serinus c. canicollis (Swainson)	1

As noted earlier, 93, or more than two-thirds of all these records, involve thrushes, and 62 of these involve eight species of a single genus of fosterers, *Cossypha*, the robin chats. The only other thrushes for which there are numerous records are *Saxicola torquata* (two races) with eight cases, *Monticola rupestris* with six instances, and *Pinarornis plumosus* with four cases; all the other thrushes have only one or two records apiece.

Next in frequency of choice as hosts are the wagtails and pipits (family Motacillidae) with 21 records involving four species. Here it should be observed that the pipits (*Anthus*) are not very important

as hosts (two species, one with a single record, the other with two) but the wagtails (*Motacilla*) are among the regular fosterers of the parasite (with 10 records for one species and 8 for the other). Of bulbuls (family Pycnonotidae) five species have been found to be parasitized 10 times; but only one of these, the common *Pycnonotus barbatus*, is known to be a frequent host (six records).

The other groups of hosts apparently are seldom bothered by the red-chested cuckoo, and it seems safe to conclude that these hosts play no important role in the cuckoo's economy and that, conversely, its effect on them is very slight. These groups include the flycatchers, tits, sunbirds, weavers, shrikes, and finches.

If we attempt to estimate the relative frequency of host selection by the red-chested cuckoo, our present data reveals the following sequence: By far the most frequently imposed upon host is *Cossypha caffra* with 35 records, followed by *C. heuglini* with 11, *Motacilla capensis* with 10, *M. alba* and *Saxicola torquata* with 8 each, *C. semirufa* with 7, *Monticola rupestris* and *Pycnonotus barbatus* with 6 each, while all the other hosts are known as yet only from single or, at most, two instances apiece.

It seems evident that unusually small hosts, such as *Remiz minutus* and *Nectarinia famosa*, are probably unusual reports in the same sense as the "freak" host records for the cuckoo (*C. canorus*) in Europe or the brown-headed cowbird (*Molothrus ater*) in North America. There are but single records for *R. minutus* and *N. famosa*, and it may be recalled that the record for the former is an old Levaillant one, unsupported by more recent evidence, that is open to doubt as I pointed out in an earlier publication (1949a, p. 77). The lone instance involving the malachite sunbird, however, is clearly acceptable as it was recorded by a very careful and reliable observer in Natal, Godfrey Symons.

All the known hosts are passerine birds and all are birds that make open nests. These cuckoos "have been said to show interest" in some of the domed or globular nests of weavers, but I know of no records of their depositing eggs in them. The absence of babblers from the list is of interest as it leaves these birds to the attention of the crested cuckoos, *Clamator*, with which the red-chested cuckoo does not seem to conflict seriously.

Not only do we now have a fairly good picture of the range of host selection of this cuckoo, but also we now have to revise our earlier conclusions about its egg morphism. When I first wrote of this matter (1949a, pp. 68–69), I could only state that the eggs showed very little variation when compared with those of the well-known common cuckoo of Europe. The majority of all the then-known eggs of the red-chested cuckoo were plain, unmarked chocolate brown to olive

brown, and the few eggs of other coloration were regarded as unusual. One of the latter, unmarked blue, is now to be considered as probably misidentified *Clamator jacobinus* eggs. To the other types then described may now be added still others, all suggesting a wide range of coloration indeed although it is still apparent that the plain brown egg outnumbers all the others many times over.

The range of color variation may be seen in the following egg types:

1. Plain chocolate brown to olive brown (the commonest type).

2. Similar to no. 1 but paler, more pinkish, less chocolate, and slightly smaller (Zululand, ex nest of *Cossypha humeralis*).

3. Pale greenish white, thickly spotted with browns of several shades (Congo, oviduct egg).

4. Pale bluish green with an indistinct band of osbcure brownish spots at the larger end (Kenya, ex nest of *Cercotrichas leucophrys*, according to Nehrkorn 1910, and ex nest of *Saxicola torquata*, both according to Schönwetter, 1964, p. 545). Pitman (1964, pp. 140–141) has described additional similar eggs: one, from a *Tchagra* nest in Southern Rhodesia, was pale green with a few rusty-brown spots, some very pale and small; another, from a *Motacilla capensis* nest in South Africa, was pale greenish, heavily marked with shades of brown ". . . and may link the previously described spotted or freckled egg with the well-known normal type which is so profusely and finely marked as to appear almost immaculate."

5. Similar to no. 4 but olive green, flecked with strong reddish brown, especially at the larger end (ex nest of *Cossypha caffra*, no locality given, according to Schönwetter, 1964, p. 545).

6. Fawn brown with intense dark reddish-brown flecks (Schönwetter, 1964, p. 545).

7. Very pale green with very delicate pale-brown and grayish-violet flecks (ex nest of *Cercotrichas ruficauda* [=*C. leucophrys brunneiceps* of our list], according to Schönwetter, 1964, p. 545).

8. Almost uniform grayish white, tinged with pale pink, with barely visible scrawls (ex nest of *Cossypha caffra*, according to Schönwetter, 1964, p. 545).

It should be mentioned that Schönwetter (1964, p. 545) writes that eggs of *Cuculus solitarius* are confused easily with those of *Cossypha*. This cannot be correct, however, in nests of *Cossypha caffra*, the most heavily parasitized species, whose eggs are whitish, freckled, especially at the larger pole, with pale brown. There is much closer agreement with the eggs of *Cossypha natalensis* and *C. dichroa*, an observation first mentioned by Roberts (1940, pp. 139–140). As may be inferred from the foregoing, there is less evidence than might have been expected for host egg mimicry in this cuckoo. The species of robin chats to whose eggs the cuckoo's own are most similar are seldom used by the parasite, whereas with no eggs of its frequent hosts do the cuckoos' eggs bear such close resemblance as to be regarded as highly evolved mimics in the same sense that some of the gentes of the European cuckoo have become. Moreau (1949) thought there was some slight adaptation in egg size by the red-chested cuckoo to the eggs of its hosts, but this is not noticeable.

Black Cuckoo: *Cuculus clamosus*

The following birds have been found to be parasitized by this species (all races combined):

	records
Pinarornis plumosus Sharpe	2
Prionops plumata poliocephala (Stanley)	1
Dryoscopus cubla hamatus Hartlaub	1
Laniarius ferrugineus pondoensis Roberts	6
L. f. natalensis Roberts	3
L. f. limpopoensis Roberts	3
L. f. transvaalensis Roberts	2
L. f. tongensis Roberts	1
L. f. aethiopicus (Gmelin)	2
L. barbarus atrococcineus (Burchell)	4
L. leucorhynchus (Hartlaub)	1
L. lühderi (Reichenow)	1
Malaconotus o. olivaceus (Shaw)	1
Oriolus auratus notatus Peters	2
Pycnonotus barbatus layardi Gurney	2
Cossypha n. natalensis Smith	2
C. c. caffra (Linnaeus)	1
C. h. heuglini Hartlaub	1
Melaenornis pammelaina (Stanley)	1
Prinia m. maculosa (Boddaert)	1
P. subflava melanorhyncha (Jardine and Fraser)	1

Of the 16 species of hosts, 6 also are known to be parasitized by the red-chested cuckoo, but 3 of these are included herein on the basis of single records, and 3 on the basis of two records each. Furthermore, one of these, *Prionops plumata*, is known as a host of the red-chested cuckoo only on the basis of its having been seen with a recently fledged young of that parasite and not on the basis of an actual nest record. The likelihood of this being a valid instance of parasitism must be accepted with some reservation since a fledgling cuckoo might attract the attention of birds other than those that actually reared it.

Not only are shrikes the chief hosts of the black cuckoo, but also the involved species of this group are not the same as those parasitized by the jacobin cuckoo, *Clamator jacobinus*. That bird parasitizes the fiscal shrike, *Lanius collaris*, very frequently. The black cuckoo has not yet been found to use this wide-ranging, common bird as a host, but the yellow-billed cuckoo does use it. The only overlapping host is the boubou, *Laniarius ferrugineus*, and for this species there is only a single record of parasitism by the jacobin cuckoo, whereas it is the commonest fosterer of the black cuckoo.

As in the case of the red-chested cuckoo, all the hosts of the black cuckoo are open-nesting passerine birds, but within this wide range of potential victims there is relatively little overlap in the host preferences of the two parasites. The instances of homoxenia between the black and the red-chested cuckoos involve 37 percent of the hosts but only 25 percent of the total records of the former species.

The eggs of the black cuckoo are variable, but so far as I know, at least in southern and eastern Africa (typical *clamosus*), they do not resemble and, hence, are not apt to be mistaken by their observers for

the plain chocolate or olive-brown, unmarked eggs of the red-chested cuckoo, *C. solitarius*, the commonest egg morph of that species. There is, however, enough similarity among other types, especially the greenish type, of the eggs of both *C. solitarius* and *C. clamosus*, to cause confusion and at times to raise some doubts as to their identification.

The eggs of *C. clamosus* may be said to be of three types: one with a whitish ground color, one with pale brownish, and one with a pale greenish ground, all variously speckled with shades of brown and gray. These types are not isolated geographically and, hence, are not typical of different populations or subspecies of the cuckoo since two or more occur in the same area.

Thus, in Cameroon, Bates (1911, pl. 9, fig. 4) found an egg of the race *gabonensis* that was pale brownish, everywhere flecked with dark umber, the speckles most heavily concentrated at one pole. Later (1927, pl. 2), he took another egg from a freshly shot hen, which had a whitish ground color, speckled all over with reddish brown and gray. From Gabon, another oviduct egg reported by Schönwetter (1964, p. 545) was pale green, abundantly flecked with burnt siena and gray. Still another oviduct egg from Cameroon was described by Searle (1965, p. 71) as having a cream-colored ground, profusely blotched and spotted with reddish-brown and with claret-brown primary and ashy-purple secondary markings, all of these markings coalescing near the large pole to form a ring.

A somewhat similar greenish egg with flecks of olive brown and gray was taken in Mozambique (typical *clamosus*), but in the same area other eggs of this cuckoo were dirty white, sharply flecked with pale brown and pale gray. Whitish eggs similar to these also were taken in Natal and in the eastern Cape Province, South Africa (Chubb, 1914, p. 62; Skead, 1951a, pp. 163–173; Roberts 1963, p. 182). A fairly similar egg, but less heavily flecked, taken in northwestern Ethiopia by Cheesman (1935, p. 311), was described as being dull white with a few reddish-brown flecks.

As in the red-chested cuckoo, it is not possible to detect the evolution of adaptive egg mimicry in the black cuckoo, but it should be noted that Searle (1965, p. 71) thought that an oviduct egg of the race *gabonensis* showed some resemblance to "certain shrike and bulbul eggs." Both species of cuckoos have a considerable range of color variation in their egg shells, and to that degree both have the possibility of developing egg adaptive gentes. The evidence available clearly shows preponderant host preferences but fails to reveal proportional egg morph specialization. Hoesch (1940) wrote that the eggs of the black cuckoo tend to match those of the boubou shrike in markings but not in color. Moreau (1949) considered that the eggs might be looked upon as showing some color resemblance to those of

two of the hosts but not to those of the commonest one. Even this seems somewhat doubtful.

Yellow-billed Cuckoo: *Cuculus canorus gularis*

The hosts of the African yellow-billed cuckoo, as stated earlier are less well known than are those of its congeners. To date, so far as I have been able to learn, the only fosterers for which there are more than single records are the drongo, *Dicrurus adsimilis;* the boubou, *Laniarius ferrugineus;* and the fiscal shrike, *Lanius collaris.* Two of the following list, the bush shrike (*Malaconotus zeylonus*) and the robin chat (*Cossypha caffra*), were listed as hosts by Levaillant over 150 years ago and have not been so reported by anyone since then. They may be considered, therefore, as indefinite, especially since they were not documented in detail by their reporter. The absence of more recent records would be cause for scepticism in the case of a better known species of cuckoo; in this case there are so very few observations, one can hardly claim that the old pioneer of African cuckoo studies has or has not been contradicted.

The recorded or reputed hosts are as follows:

	records		records
Dicrurus a. adsimilis (Bechstein)	3	*Lanius collaris* Linnaeus	4
Pycnonotus barbatus tricolor (Hartlaub)	1	*Cercotrichas p. paena* (Smith)	1
Lamprotornis species	1	*C. leucophrys pectoralis* (Smith)	1
Laniarius ferrugineus	3	*Cossypha caffra* (Linnaeus)	1
Malaconotus z. zeylonus (Linnaeus)	1	*Passer griseus diffusus* (Smith)	1

It is of interest to note that, unlike its two African congenors, this cuckoo does make some use of nests in holes in trees, as shown by the instances of the glossy starling and the gray-headed sparrow. It may be recalled that Haydock (1950, pp. 149–150) in Northern Rhodesia saw a pair of an unidentified species of *Lamprotornis* feeding a recently fledged red-chested cuckoo. Because it is known that adult birds of many species often react with food to the clamorous importuning of fledgling birds that they have not reared themselves, this record is not included in our list of hosts of *Cuculus solitarius.* The fact that the yellow-billed cuckoo has been found to lay in a nest of a glossy starling may lend probability to the nature of Haydock's record, but it still remains uncertain. In its use of shrikes' and of drongos' nests as repositories for its eggs, the yellow-billed cuckoo does compete with the jacobin cuckoo, but the latter parasitizes drongos very seldom.

Eggs of three types have been described for the yellow-billed cuckoo: pale greenish blue with pale mauve and brown spots; light bluish gray

with blotches of slate and dark greenish olive brown, more numerous at the large pole, but present elsewhere as well; and very pale pink with spots of mauve and russet, the spots slightly more concentrated at the blunt end of the egg than elsewhere (Pitman, 1957, p. 139). The first two of these were taken in the same area in Southern Rhodesia by Neuby-Varty (1948, 1950), a fact that shows the nongeographical nature of the variability. An uncertainly identified egg found in a scrub robin's nest (*Cercotrichas*) in Northern Rhodesia and attributed to this cuckoo by Lees (1938, p. 18) was said to have a coffee-colored ground, darkening at the wide end. The identification of the two eggs taken by Neuby-Varty is completely acceptable; the one reported by Lees was identified "by elimination," i.e., it was thought to be *C. gularis* because it did not fit either *C. solitarius* or *C. clamosus*. This record cannot be looked upon as more than a guess.

In light of the limited data on the yellow-billed cuckoo, it is premature to generalize, but what little we know does not suggest any marked development of host egg mimicry. The fact that eggs with a pinkish-ground color, described above, were all found in nests of drongos, whose own eggs have a pinkish ground, may suggest some incipient tendency in this direction, but the number of cases is still too small to show a real trend.

The absence of marked adaptive host egg resemblance in the eggs of the three species of largely sympatric African *Cuculus*, all of which show considerable variation in coloration, makes one wonder if alloxenia may have the effect of reducing the need for such a development and if this differential host selection, therefore, may be reflected in the fact that little or no adaptive egg evolution has taken place. It seems hardly likely that this in itself could have had that result although natural selection is by no means restricted to items of large value: small changes, provided they are advantageous, are equally apt to be acted upon by natural selection over a sufficient period of time. If the three species of *Cuculus* were homoxenic, adaptive host egg resemblance might be more critically important because of the competition for the same hosts by the several parasites. Even in a state of relatively good, if not total, alloxenia, such adaptations would seem to be of sufficient value to have occasioned more evolutionary change than appears to have transpired. This is what has happened with the completely allopatric European cuckoo and has resulted in that case in the formation of host-specific gentes with well-marked egg mimicry. The situation in the European cuckoo's African congeners is, therefore, puzzling, but it has the features outlined in this paper. The gentes in the European cuckoo differ from each other only in their egg shell coloration and in their host choice. It is only in their egg shells that the gentes show any change

comparable to the slight morphological characters of the "host races" described in some groups of insects and nematodes specific on diverse plant hosts. As Mayr (1963, p. 458) has pointed out, these organisms may concentrate upon specific hosts in one area but are able to establish themselves equally well on others elsewhere. This is equally true of the European cuckoo in areas that have experienced ecological disturbances owing to agriculture or to other inroads of human influence.

An important point should be stressed. In the European cuckoo we have good evidence of individual host specificity; in the African species of *Cuculus* we have none. We only assume, with some reason but not with any real evidence, that probably each hen lays all its eggs in nests of a single species of host. If anything, the actuality of alloxenia in these sympatric parasites argues for such individual host constancy.

Appendix: Source Data on Host Records

Additional data on host records of the three African species are appended herein for the benefit of readers of this paper who may otherwise wonder where the records came from. Instances that are merely additional and repetitive cases are not considered necessary to describe but have been included in the enumeration given for each host earlier in the paper. (See also: Bouet, 1961; Rorke, 1947; Skead, 1951b.)

Cuculus solitarius

In the list of known hosts of the red-chested cuckoo given earlier in this paper, some 14 kinds of birds are added to my earlier (1949a, 1949b, 1956) compilations of the fosters of this parasite. The data for these additions as well as new records for little known but previously recorded hosts are as follows:

Tchagra species: Nest with a red-chested cuckoo egg found at Baragoi, Samburu district, Kenya, by Pitman (1964, pp. 140–141).

Andropadus virens virens: Listed as a host in Fernando Poo by Basilio (1963).

Chlorocichla flaviventris centralis: Found to be parasitized in the Ngong region, Kenya, by van Someren (1956, p. 154).

Pinarornis plumosus: A parasitized nest reported from Northern Rhodesia by Benson and Pitman (1956, pp. 37–38). Refers also to a second instance, from Southern Rhodesia, collected by Plowes. Since then R. K. Brooke has sent me two more Rhodesian records, one observed at Plumtree, Mar. 6, 1961, by C. J. Vernon, and one by A. W. Wragg at the same place on Dec. 16, 1962.

Cercotrichas barbata: One overlooked record from the Zimbiti district, Mozambique, reported by Sheppard (1914, p. 3). If the subspecies *rovumae* should be reinstated this host record would refer to that race.

Alethe archeri: van Someren (in litt., May 14, 1961) informed me that his chief collector Yokana found a young fledged red-chested cuckoo cared for by this thrush in the Humia valley, west Ruwenzori, in 1946.

Pogonocichla swynnertoni: One record, a nest containing a red-chested cuckoo egg, found at Stapleford, near Umtali, Southern Rhodesia, Jan. 8, 1963, by A. Williams and reported to me by R. K. Brooke.

Cossypha semirufa intercedens: In the Ngong area, Kenya, van Someren (1956, p. 306) reported this as the chief victim of the red-chested cuckoo, writing that the "three pairs of cossyphas that nest near my stream are regularly victimized; they seldom raise a brood of their own . . . ."

Cossypha cyanocampter bartteloti: van Someren (in litt., May 14, 1961) reported a female of this thrush caring for a young red-chested cuckoo in the Kyetume area, Uganda, in 1912.

Cossypha niveicapilla melanonota: van Someren (in litt., May 14, 1961) wrote me that in 1913 he found several nests of this robin chat, each with an egg of the red-chested cuckoo, in the Mabira Forest, Uganda. It is not possible at this late date to check this statement, but it should be noted that the black cuckoo, *C. clamosus jacksoni*, also occurs in the Mabira Forest.

Neocossyphus poensis praepectoralis: Listed as a host in Fernando Poo by Basilio (1963).

Stizorhina fraseri fraseri: Said to be victimized in the island of Fernando Poo (Basilio, 1963).

Turdus libonyanus tropicalis: Pitman (1961, pp. 48–49) lists three instances of parasitism on this thrush by the red-chested cuckoo, all in Southern Rhodesia.

Muscicapa adusta adusta: One additional record for this seldom-used host has come to my attention from R. I. G. Attwell (in litt., Apr. 10, 1963), who found a pair of these flycatchers with a fledgling red-chested cuckoo at Knysna, Cape Province, Dec. 28, 1962.

Terpsiphone rufiventer tricolor: Listed as a host in Fernando Poo by Basilio (1963).

Terpsiphone viridis viridis: Jessop (1960, p. 179) reported a nest of this paradise flycatcher with a red-chested cuckoo's egg near the Sir Lowry's Pass River, Cape Province, on November 4, 1956.

Cuculus clamosus

The list of hosts of the black cuckoo presented in this paper includes a few on which further data should be presented:

Pinarornis plumosus: One record is known of this babbler as a host of the black cuckoo. McLean (1957) found a parasitized nest at Que Que Reserve, Southern Rhodesia, November 26. He saw the cuckoo fly out of the nest, which, on inspection, was found to contain one egg of the parasite and two of the host.

Laniarius barbarus atrococcineus: The known instances of parasitism on this shrike recently have been doubled. Rowan, Skead, and Winterbottom (1964, p. 235) noted that a pair of these shrikes was seen caring for a fledgling black cuckoo at Hoffnung, Damaraland, February 11. In the Wankie Game Reserve, Southern Rhodesia, Vernon (in litt., 1961) made a similar observation in January 1958.

Oriolus auratus: To the single instance mentioned in my earlier (1949a) list may be added a second one. Benson and Pitman (1956, p. 25) found a nest at Kasana, Zambia, November 14, containing two newly hatched young, one of which turned out to be a black cuckoo and became the sole occupant of the nest five days later.

Cossypha natalensis: Oatley (1959, p. 431) recorded this robin chat as a victim of both the black and the red-chested cuckoo. Previously only a single record of its serving as a host to the black cuckoo was known to me.

Cossypha heuglini: Heuglin's robin was added to the known hosts of the black cuckoo by McLean (1957), who found it to be parasitized in the Que Que Reserve, Southern Rhodesia, November 28.

Cuculus canorus gularis

To the still limited information on the hosts of the African yellow-billed cuckoo the following should be added:

Laniarius ferrugineus: G. Duve (in litt., 1962) informed me that he has in his collection three parasitized sets of eggs of the boubou, each with one egg of this cuckoo, all taken near Johannesburg, Transvaal, October 2 to January 12.

Lanius collaris: In the Transvaal, G. Duve (in litt., 1962) found three instances of the black cuckoo parasitizing the fiscal shrike.

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